Chapter 5 SUPPORT OF THE AIDS TO NAVIGATION PROGRAM

A. BACKGROUND

1. The Aids to Navigation (ATON) program helps to insure the safety, security and efficiency of the maritime transportation infrastructure by:

   a. Operating long range electronic radio navigation aids (LORAN-C) as well as domestic radio beacons.

   b. Maintaining short range aids to navigation, such as lights, fog signals, buoys, day beacons, and RADAR transponders (RACONS).

   c. Operating vessel traffic services (VTS) in several key ports.

2. The inventory of federal aids to navigation maintained by the Coast Guard consists of over 48,000 buoys, beacons, and other aids to navigation. These aids to navigation are distributed along the coastal and inland waters of the United States, its territories, and the Trust Territory of the Pacific. In addition, the Coast Guard regulates more than 45,000 private aids to navigation.

3. As with many other programs, the Coast Guard Auxiliary provides assistance to the Coast Guard (and other concerned federal agencies) in myriad ways, including reporting discrepant aids to navigation, verifying private aids, and submitting chart corrections/updates.

4. The sight of Coast Guard small boats and buoy tenders examining and maintaining aids to navigation is familiar to Auxiliarists and mariners alike. Given the care and diligence required in this activity (e.g., the use of horizontal sextant angles and precise electronic systems for determining whether or not a buoy is off station) it may seem odd to include this activity in a text on air operations, where the observer may be limited to brief glimpses of such aids from a rapidly moving platform at altitudes of 1000 feet or more. Nonetheless, pilots and observers can make a substantial contribution to the ATON program. The relatively high speed of the typical Auxiliary aircraft permits a rapid search of an area to identify aids that may have discrepancies of one type or another. Potential problems with these aids can be confirmed by follow-up visits by surface craft or other assets.

5. To be effective in most operational programs, Auxiliarists need specialized training and can benefit greatly from detailed local knowledge. The ATON program is no exception in this regard. Indeed, it can be argued that the ATON program is particularly demanding of specialized expertise and detailed local knowledge. Pilots, air crew, and observers seeking to employ aircraft in support of the ATON and chart updating programs should be thoroughly familiar with applicable guidance documents and district policy.

B. MISSIONS

1. In addition to the usual logistics, VIP transport and area familiarization flights that can be undertaken in support of this program, there are two other specialized missions that are supported; they are discrepancy reporting and chart updating.

C. ATON DISCREPANCIES

1. Table 5.1 presents a brief list of common ATON discrepancies, partitioned into the conventional classifications of critical, urgent, and routine. For each discrepancy, a subjective (but informed and conservative) estimate of the probability of detection (POD) from a typical Auxiliary aircraft is provided. Night ATON flights are not authorized without written consent from the District Director. Altitude restrictions must be adhered to.

Table 5.1 Marine Aid to Navigation Discrepancies

MARINE ATON DISCREPANCIES		
Class and Action required	Discrepancy	Remarks on Aircraft Detection
CRITICAL Federal aids only discrepancies, report by radio	1. Aid totally covered or shrouded in ice	Probability of Detection (POD) likely to be high
	2. Light signal showing improper characteristics or rhythm	POD low
	3. Light signal obscured or extinguished	POD can be high, depending on circumstances
	4. Sinking or submerged or extinguished	POD likely to be high
	5. Buoy off station, adrift, missing, capsized or stranded	POD likely to be high for buoys markedly off station, missing, capsized or stranded
	6. Radio beacon off the air or giving improper characteristics	POD likely to be high if aircraft is equipped with proper ADF and current LIGHT LIST
	7. Vandalism of aids either in progress or the result of such action	Variable POD, depending on type and extent of vandalism

Table 5.1 Marine Aid to Navigation Discrepancies Cont.

MARINE ATON DISCREPANCIES		
Class and Action required	Discrepancy	Remarks on Aircraft Detection
CRITICAL Federal aids only discrepancies, report by radio	8. Aids damaged by vessel collision	Variable POD, depending on nature and extent
	9. Collapsed bridge structures and fender systems	Variable POD, high for major damage
URGENT Federal aids only report by telephone or radio to group	1. Dayboard missing or damaged by causes other than vandalism	POD variable
	2. Sound signal failure; whistle, bell, gong	Detection impossible
	3. Radio beacon timing sequence incorrect	POD high if aircraft equipped with ADF and light list
	4. Light burning dimly or showing reduced intensity	POD low
	5. Light partly or totally obscured by dayboards	POD low
	6. Bridge light out inoperative bridge	POD low
ROUTINE Federal and private report by mail or telephone	1. Aid obscured by foliage or other objects that should be removed	POD low
	2. Faded dayboards	POD low
	3. Delaminated of dayboards	POD low
	4. Leaning structures	POD low
	5. Bird nest on aids	POD low
	6. Improper dayboards	POD low

2. Several examples are furnished below to illustrate the use of the table and to provide amplifying remarks about certain judgements.

3. Sinking or submerged buoys (item 4 under critical discrepancies) are quite likely to be detected by trained and competent observers in an aircraft. This is particularly true in cases where the pilot or observer has substantial local knowledge, visibility is well above minimums for flight under Visual Flight Rules (VFR), and the location of the buoy is such that there are numerous landmarks to facilitate orientation/navigation. Detection of missing buoys in a well-identified

harbor or marina entrance is relatively simple. Detection of a missing buoy may be more difficult for offshore buoys if the aircraft does not have a functioning LORAN-C or GPS receiver. This is necessary because the aircraft has to be quite certain of its position to draw the inference that an unseen buoy is missing or off station.

4. Buoys off station, adrift, capsized, or stranded are also judged to have a high POD. The fact that a buoy is only slightly off station may not be able to be determined from the air, because it is not possible to establish the actual location of the buoy. A buoy markedly off station is likely to be detected. Beached or capsized buoys are easily detected.

5. Radio beacons off the air or giving improper characteristics are likewise easily detected, provided the aircraft has an automatic direction finding (ADF) receiver and a light list to consult for details on frequency and characteristics.

6. Vandalism is a more difficult detection challenge. It is relatively easy to spot vessels tied up to buoys or other ATON structures and/or persons on such structures, but the detection of damage is difficult if the damage is only slight.

7. Aids damaged by vessel collision are judged to have a variable POD, depending on the extent of damage. It is difficult to distinguish the cause of damage (collision or vandalism) from close in surface inspection let it alone from the air.

8. Under the right circumstances (e.g. in cases where the aircraft's position can be fixed precisely, observations are taken during darkness, or the twilight before or after darkness, and in good visibility) it is relatively easy to determine that a navigational light is not present. This may mean that the buoy or structure is missing or that the light is inoperative. In other cases (e.g. "cluttered" lights in the vicinity of a harbor) detection and identification may be more difficult. For this reason, the "remarks" column under this task is written as "POD can be high, depending on circumstances". Ideally, a patrol should be run after twilight when the light level is low enough so that both the lights and the buoy or light structure would be visible.

9. A careful reading of Table 5.1 indicates that aircraft can be expected to perform well for many of the critical discrepancies, some of the urgent discrepancies, and a few of the routine discrepancies. Although the overall performance of the aircraft platform is limited, the fact that aircraft are useful for detection of so many critical discrepancies is noteworthy.

10. The ability to identify critical discrepancies and to cover large areas in a short time is particularly valuable for "after storm surveys" to asses the damage after major storm events. In winter, over-flights can be used to assess damage to buoys and other aids resulting from ice.

D. CHART UPDATING

1. The Coast Guard Auxiliary furnishes valuable information to the National Oceanic and Atmospheric Administration (NOAA) and the National Ocean Survey (NOS) for chart correction and updating of nautical and aeronautical charts. (For general information, background, and a discussion of appropriate forms to use, see the latest edition of the AIDS TO NAVIGATION AND CHART UPDATING MANUAL.) Auxiliarists on land and in surface vessels have gathered the necessary appropriate data for this purpose for many years. Until recently, aircraft have not been widely used as an observation platform. There is an increasing realization of the utility of aircraft in the chart-updating program.

2. Table 5.2 provides a capsule summary of the type of information useful for the chart updating mission together with brief remarks on the suitability of aircraft as an observation platform. As a general proposition, it is fair to state that aircraft can detect and identify many of the objects (e.g., bridges, dikes and levees, jetties and breakwaters, marinas, dry docks, utility lines, docks, landmarks, towers, etc.) that may need to be added or deleted from nautical and/or aeronautical charts. Some of the technical or measurement information needed such as lighting, dimensions, clearances, contents of pipelines, channel depths, etc., may need to be gathered by a ground follow-up survey. In other words, aircraft observation is used to detect and identify items relevant for chart correction but additional "ground truth" information is also needed. A typical chart updating mission, perhaps integrated with a conventional safety patrol, would have onboard observers annotating appropriate charts with the approximate location of items of interest for later follow-up with automobiles or surface vessels.

3. Operators of aircraft specially equipped for aerial photography can gather imagery directly suitable for photographic purposes. Even oblique 35mm photography is useful for documentary purposes to accompany information contained on appropriate forms.

4. Experience shows that chart updating from the air is a somewhat tedious process, although certainly interesting to many, requiring careful preparation and attention to detail. It is recommended that only limited areas be surveyed at any one time; the balance of the operating area can be surveyed on subsequent flights. Limiting the extent of the survey permits the observers to become intimately familiar with the charted features so that differences (candidates for updates) can be readily and efficiently identified.

E. OTHER MISSIONS

1. In addition to the two missions described above, there are many other opportunities for the use of aircraft in support of the ATON mission. Here are a few examples. It is often helpful to provide area familiarization over-flights for ATON personnel. Flying a "pre-cruise" mission for the crew of buoy tenders

provides them with a bird's eye view of the mission area, may help to identify additional discrepancies that need to be corrected, and help to determine what additional supplies need to be taken aboard the buoy tenders.

2. Whenever there is a change of command for a locally based buoy tender, there is an opportunity to take the incoming and outgoing Commanding Officers (CO) on an area familiarization flight. The use of aircraft enables the new CO to become familiar with the peculiarities of the area via the exchange of information from the outgoing CO as they fly over the command's area of responsibility.

3. There are occasions when a part for a ship or a special item to repair an aid needs to be transported quickly to a remote location. Auxiliary aircraft are effective for this purpose.

4. As commercial and recreational boating expands, additional aids to navigation may be required. Group or district personnel can use Auxiliary aircraft to aid in the planning process. Auxiliary over-flights can also be used for special purpose surveys, such as vessel counts that may also be useful in evaluating the need for additional aids.

Table 5.2 Chart Corrections/Updates

CHART CORRECTIONS/UPDATES TABLE		
OBJECT	**ITEM TO BE REPORTED**	**REMARKS ON LIKELIHOOD OF AERIAL OBSERVATION**
Airports, landing strips	Identify new or discontinued	New airfields are relatively easy to identify. Abandoned fields or runways marked with an "X" are easy to detect
Bridges	New, removed, under construction or ruins. Give location, type, lights, vertical and horizontal clearances	Many of these items can be easily seen from an aircraft. Clearance data requires ground survey
Cables	Over or under navigable waters. Give location, type, and clearances	Pylons for overhead cables are relatively easy to detect. Clearance data requires a ground survey.
Channels	Report new or revised channels. Indicate centerline, controlling depth and width discrepancies for existing channels other than Corps of Engineers project channels	Changes in the flow pattern of a channel are often visible from the air. Depths and other information require ground based follow-up effort
Coast Guard Station	New, discontinued, or change in facilities	Best handled administratively rather than by aerial observation
Cribs and water intakes	Visible or submerged give size & type of construction and depth in submerged	General features visible. Ground follow-up necessary for technical and measurement data
Dams	Type, position, lights and other pertinent data	New construction easily visible
Dikes and levees	Type height and extent	New construction easily visible
Dolphin and other pilings	Visible or submerged	Large objects are easy to detect
Dry-docks	New or discontinued	Easily visible from the air. Observers need to be familiar with the appearance of a dry-dock
Duck blinds	Temporary or permanent structures	Generally visible from the air. Likelihood of detection may vary with the season and lighting

Table 5.2 Chart Corrections/Updates (Cont.)

TABLE 5.2 CHART CORRECTIONS/UPDATES (CONT.)		
OBJECT	**ITEM TO BE REPORTED**	**REMARKS ON LIKELIHOOD OF AERIAL OBSERVATION**
Dumping grounds and spoil areas	Extent of same	Surface features generally visible from the air
Fish havens	Obstruction (artificial fish havens)	N/A
Fish trap area	Show limits of area covered	N/A
Fish stakes	Visible or submerged. (outside of charted trap area)	Detection sometimes possible
Ferries	Type, docking facilities and overhead cables	Easily visible
Groins	Type, visible, submerged or ruins	Easily visible
Jetties and Breakwaters	Type, visible, submerged or ruins	Easily visible
Landmarks	New, destroyed or obscured. Recommend new ones that are visible from seaward	Better done by a surface vessel
Log booms	Extent and location, Is it a navigational hazard?	Easily visible
Marinas & marine facilities	Report new or discontinued	Easily visible
Marine railways	New or discontinued include length	Easily visible (use ground survey team for information)
Obstructions	Type, visible, submerged permanent or temporary	Easily visible
Platforms	Type, markings, hazards	Easily visible
Piles	Visible or submerged, single or multiple	Easily visible
Pipeline	Overhead or submerged	Sometimes visible
Ramps	Type, surface and length	Easily visible
Radio antennas	New or removed and height	Can be detected
Rocks	Visible or submerged, single or cluster	Sometimes visible
Ruins	Nature of ruins	Variable
Sewer outlets	Size, type of construction	Visible, look for changes in water color, ice melt, water disturbances
Shoals	Visible or submerged	Variable
Wrecks	Visible or submerged	Visible from air

F. TRAINING

1. As noted above, the ATON mission is more specialized and technical than many other Auxiliary tasks. This places a premium on trained observers trained as both observers and ATON mission aid verifiers. Although annual and other recurrent training such as the annual air operations seminar, can be useful for this purpose, additional training may be necessary.

2. It has been said that "sight is a faculty, seeing is an art." Beginning pilots are often at a loss to see ground features pointed out by instructors, some as important as their own airport, because they have not acquired the necessary experience viewing things from the air. Over time, the beginning pilot gains this ability to detect and identify items from the air. In the same way, pilots and observers can be trained to identify objects of navigational interest from the air. The rate of learning is facilitated if pilots and observers are familiar with the appearance of objects of interest from the ground. It is obvious, for example, that aviation personnel will have trouble identifying dry docks and marine railways from the air if they do not know what they look like from the surface.

3. It is strongly recommended that ATON training is done in conjunction with your local Coast Guard group or station. Take active duty personnel on your ATON training flights. They will be able to assist you in learning how to recognize navigational aids. At the same time the station personnel will get an idea as to just what Auxiliary aircraft can and can not do.

G. SAFETY

1. Aerial surveying of aids to navigation should be accomplished from close enough to observe relevant objects, but not at the risk of causing alarm to persons on the ground. When possible the aircrew should consist of two pilots as well as an air crew or observer qualified Auxiliarist.